

REMARKS

The Office Action has allowed Claims 85, 90, 94 and 95. But, it has rejected Claims 73-72, 86, 96-107, 111-152 and 154-180 under 35 U.S.C. §112, first paragraph as allegedly failing to describe the subject matter therein. In addition, Claims 97-101, 109-110, 115-118, 120-121, 133-140, 156, 158-161 and 171-180 are rejected under 35 U.S.C. §112, second paragraph for allegedly failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Further, Claims 133-134, 138 and 161 are rejected under 35 U.S.C. §112, fourth paragraph, as allegedly being of improper dependent form or failing to further limit the subject matter of a previous claim. Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 92, 96-107 and 109-180 are rejected under 35 U.S.C. §101 as allegedly being directed to a natural product. Finally, Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 92, 96-107 and 109-180 are rejected under 35 U.S.C. §102(b) as allegedly being anticipated by the teachings of Kroto, et al. in Nature, 1985, 318, 162-163 ("Kroto, et al.") with Curl, et al. in Scientific American, 1991, 54-63 ("Curl, et al.") allegedly cited to show an inherent state of fact.

Applicants have amended claims and cancelled claims, which when considered with the comments hereinbelow, are deemed to place the present case in condition for allowance. Favorable action is respectfully requested.

Applicants have cancelled, without prejudice, the subject matter of Claims 45-51, 74, 77, 83, 88, 97-101, 109, 110, 115-118, 120, 121, 133-140, 158-161, 163, 164 and 171-180. However, applicants have not abandoned the subject matter therein and reserve the right to file one or more continuation applications directed thereto.

Nevertheless, due to the cancellation thereof, the rejections thereof on the various grounds espoused in the Office Action have been rendered moot.

In addition, Claims 72 and 156, have been amended to make minor changes thereto. Applicants have deleted the terms, "column chromatography, HPLC, preparative thin layer chromatography" and replaced it with the more generalized term "chromatography". Moreover, the term "fractional crystallization" has been deleted from Claim 72 and 156 since it is subsumed under the more general term, "crystallization" recited therein.

No new matter has been added to the application.

These amendments to the claims simplify the issues on Appeal.

In support of the rejection under 35 U.S.C. §112, the Office Action alleges that there is inadequate support for the term "macroscopic" therein.

Applicants strongly disagree. On the contrary, the term "macroscopic", as used in the rejected claims, is fully supported by the underlying specification. The term "macroscopic" as used in the rejected claims is used in association with amounts of C₆₀ and/or C₇₀. Contrary to the allegations in the Rejection, in this context, there is adequate support, in accordance with the written description requirement of 35 U.S.C. §112, first paragraph, for the term "macroscopic amount" as it relates to C₆₀ and/or C₇₀.

The written description requirement of 35 U.S.C. §112, first paragraph, provides that:

[t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise and exact terms so as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make and use the same... (emphasis added).

The written description requirement, which is distinct from the enablement and best mode requirements, serves to ensure that applicants have possession of the invention at the time of the

filing of the application. In re Wertheim, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976). In order to meet the written description requirement, the applicant does not have to use any particular form of disclosure to describe the subject matter, but the "description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." In re Gosteli, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). In other words, the applicants must convey with reasonable clarity to the skilled artisan that as of the filing date he or she was in possession of the invention. Vas Cath., Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ 2d 1111, 1117 (Fed. Cir. 1991). Literal support is thus not necessary for compliance with the description requirement. Id.

There is adequate support in the application for the term "macroscopic" in the application. More specifically, support for this term and concept permeate the specification. For example, attention is directed to Example 1 of the instant specification wherein it is specified that the C₆₀ product is obtained as a powder and wherein the color of the product produced therefrom is indicated. Obviously, the isolation of a product as a powder taken together with the fact that it is a colored powder connotes that the product could be seen with the naked eye, consistent with the use of macroscopic amounts recited in the claims. Furthermore, attention is directed to Page 7, Lines 10-25 of the specification, where it describes that when the sooty product was placed into a non-polar solvent, e.g., benzene, the benzene became colored and the product produced after extraction with the non-polar solvent is colored. Obviously, one cannot determine these characteristics unless it is present in amounts that can be seen with the naked eye, i.e., macroscopic amounts. For example, if less than macroscopic amounts were produced, no color would be seen. See, Curl, et al, Scientific American 1991, 54-55. In addition, attention is directed to Page 11, Line 30 of the instant specification wherein it is indicated that the IR is

taken of an approximately two micrometer thick C_{60} coating on a silicon substrate. Especially since C_{60} is colored, it is obvious that this coating had to be seen with the naked eye.

Furthermore, the application makes additional references to characteristics of the product that can only be discernible if the material is present in macroscopic amounts. For example, the application describes that the product produced by sublimation of the carbon soot can range from a uniform film to a coating, and the color is brown to gray depending on the thickness of the coat formed, while the product obtained from extraction is a dark brown to black crystalline material. Obviously, these characteristics, especially color, can be differentiated if the product was produced in amounts that can be seen with the human eye. In addition, on Page 2, Line 13, the application states that before the prior invention, no one had made C_{60} or C_{70} in appreciable amounts. The implication is that the present inventors were successful in achieving this goal, consistent with the teachings in the application. Appreciable by definition means "enough to be perceived", See Webster Unbridged Dictionary 2nd Ed. p. 91 (1983). Thus, "appreciable" connotes large quantity, and is consistent with the term "macroscopic". All of these descriptions taken together as a whole connote that the C_{60} was produced in macroscopic amounts.

Attention is further directed to the Kroto Declaration dated June 9, 1995, especially Paragraphs 14 and 15, in which he attests that the application adequately describes the method for making macroscopic amounts of fullerenes, such as C_{60} and C_{70} , and that based upon the teachings in the application, it is his opinion that the inventors had in their possession at the time of the filing of the application macroscopic amounts of same. Kroto, who is a skilled artisan in the field, and who won a Nobel Prize in Chemistry for discovering fullerenes, understood from reading the application that the applicants had made macroscopic amounts of e.g., C_{60} and had it in their possession at the time of the filing of the application, providing

further evidence that there is adequate support in the specification for the term "macroscopic". Yet, the Rejection never comments or discusses Dr. Kroto's testimony. Since a skilled artisan testified that the application describes the production of fullerenes, such as C₆₀, in macroscopic amounts, how can the United States Patent and Trademark Office ignore or dismiss such a statement? Case law had held that if a person of ordinary skill in the art would have understood from reading the specification that the inventor had possession of the claimed invention at the time of filing the application, then the written description required by 35 U.S.C. §112, first paragraph, is met. In re Alton, 76 F.3d 1168, 37 USPQ2d 1578 (Fed. Cir. 1996). The testimony from Dr. Kroto is undisputed factual evidence on this issue. In view of this evidence and in the absence of any evidence to the contrary, it is respectfully submitted that only one conclusion can be reached-- that the written description requirement under 35 U.S.C. §112, first paragraph is met.

Attention in this regard is also directed to the Supplemental Declaration of Harold W. Kroto under 37 C.F.R. §1.132 dated November 16, 1999. Dr. Kroto testifies that the specification provides evidence in several instances that the inventors had produced C₆₀ and C₇₀ in macroscopic amounts. For example, he refers to Example 1, which "describes the product thereof in powder form as brownish-red. Such language connotes, in my opinion, that the product thereof could be seen with the naked eye..." This testimony supports the position of applicants.

Thus, Dr. Kroto's testimony clearly evidences that he read the application and that the application clearly conveys to one of ordinary skill in the art that the inventors had produced C₆₀ and C₇₀ in macroscopic amounts. This testimony cannot be ignored by the United

States Patent and Trademark Office. See, In re Alton, 76 F.3d 1168, 37 USPQ2d 1578 (Fed. Cir. 1996).

Moreover, further attention is directed to Paragraphs 15 and 17-19 which are produced in part hereinbelow.

In Paragraph 15 of the Declaration Kroto further testifies as follows:

Moreover, based upon repetition of the process described therein, as described hereinbelow, the process as described in the above-identified application, especially in Example 1, inherently produces fullerenes, e.g., C₆₀, in amounts that could be seen with the naked eye.

Dr. Kroto further testifies in Paragraphs 17, 18 and 19 of the Declaration as follows:

17. Utilizing the procedure exactly as described in the above-identified application, I have had fullerenes, including C₆₀, prepared in macroscopic amounts on numerous occasions since 1990 to the present. More specifically, by following the procedure described in the above-identified application and vaporizing graphite rods in an atmosphere of helium, forming the carbon soot therefrom, collecting the soot and dissolving the soot in benzene, in accordance with the procedure described in the above-identified application, I and my colleagues have prepared and identified various fullerenes, including, inter alia, C₆₀...

18. Moreover, by following the procedure described in the above-identified application, and in accordance with the procedure outlined in Paragraph 17 herein, we have isolated fullerenes in macroscopic amounts, as defined herein. For example, utilizing the procedure outlined in Paragraph 17, I have found that the smoky carbon product contains 5 to 10% C₆₀ and 1% C₇₀. We routinely produce the soot in 1-5 gram quantities and routinely extract 100-500 milligram amounts batchwise. Thus, one kilogram of sooty carbon product produces, on average, 100g of C₆₀, 10g of C₇₀ and 1 gram of other fullerenes, such as those indicated hereinabove. The various fullerenes formed can and are isolated in accordance with the isolation and

purification procedures described in the above-identified application, without an undue amount of experimentation. Furthermore, the various fullerenes are isolated as solids, which are easily visible to the naked eye. For example, in a typical experiment conducted according to the procedure described in the above-identified application, C₆₀ is formed in about 100 mg quantities, C₇₀ in about 10 mg quantities and the remainder in about 1 mg quantities.

19. Thus, by following the procedure described in the above-identified application, I have found that the process described therein inherently produces ... C₆₀, in macroscopic amounts. In fact, by following the procedure of Kratschmer and Huffman, outlined in the above identified application, crystalline material of fullerenes, including C₆₀, is produced which can be seen with the naked eye.

Thus, Dr. Kroto testifies that by following the procedure in the teachings in the above-identified application, one of ordinary skill in the art produces, inter alia, macroscopic amounts of C₆₀ and/or C₇₀. In other words, Dr. Kroto testifies that C₆₀ and/or C₇₀ is inherently produced in macroscopic amounts if one of ordinary skill in the art follows the teachings in the above-identified application for producing same.

Case law has held that words describing a function or property that was inherent in the specification is considered to be supported by the disclosure and supports the adequate written requirement, in accordance with 35 U.S.C. §112, first paragraph. See, In re Reynolds, 443 F.2d 384, 170 USPQ 94 (CCPA 1971). In Reynolds the question was whether words describing a function that was inherent in the claimed product could be added to the specification by amendment, or whether such description was "new matter". The Reynolds court cited with approval the holding in Technicon Instruments Corp. v. Coleman Instrument, Inc., 255 F.Supp. 630, 640-641, 150 USPQ 227, 236 (N.D. Ill. 1966), aff'd, 385 F.2d 391, 155 USPQ 369 (7th Cir.

1967), that: "By disclosing in a patent application a device that inherently performs a function, operates according to a theory, or has an advantage, a patent applicant necessarily discloses that function, theory, or advantage even though he says nothing concerning it." In re Reynolds, 433 F.2d at 389, 170 USPQ at 98. It was concluded that the express description of the inherent property, since not "new matter", could be added to the specification with effect as of the original filing date. Id.

Therefore, the disclosure in an application of an inherent property satisfies the written description requirement with respect to that property. Id., see also, Kennecott Corp. v. Kyocera International Inc., 835 F.2d 1419, 1422, 5 USPQ2d 1194, 1197 (Fed. Cir. 1987), cert. denied, 486 U.S. 1008 (1988).

This case not only is relevant but is instructive. Dr. Kroto's testimony indicates that the process described in the underlying application inherently produces C₆₀ and/or C₇₀ in macroscopic amounts. In accordance with the holding of Reynolds, the inherent production of C₆₀ and/or C₇₀ in macroscopic amounts provides adequate support for the term "macroscopic" to be used in the claims.

Attention is further directed to the Declaration of Dr. Loutfy executed on July 16, 2002, containing 19 paragraphs (hereinafter "Loutfy I Declaration"). Dr. Loutfy testifies that the process of the present invention inherently produces fullerenes, e.g., C₆₀ and C₇₀, in macroscopic amounts (See Paragraph 11 of Loutfy I Declaration). Dr. Loutfy further testifies that when he performed an experiment based upon the teachings in the underlying application, including Example 1, in which graphite rod ¼ inch in diameter and 17 cm long, was vaporized at 100 torr Helium using 100 ampere dc current for about 50 minutes, he produced 12 grams of soot. He extracted the soot with toluene and the yield of fullerene was about 8 to 10%. Thus, he

recovered over 1.2 grams of fullerene, with over 900 mg of C₆₀ and over 200 mg of C₇₀. See paragraph 17 of Loutfy I Declaration. Since amounts as low as 0.1 mg can be seen with the naked eye, this amount of C₆₀ and C₇₀ can be seen with the naked eye. Id.

If he utilized a shorter length of graphite such as 1 cm length, as discussed in the underlying application including Example 1, he still produced macroscopic amounts of fullerene including 50 mg of C₆₀ and 10 mg of C₇₀, which is still greater than the lower limit of 0.1 mg seen with the naked eye. Furthermore, if one calculates the amount of soot that would be produced from a 1 cm length and ¼ inch diameter graphite rod, the calculation would estimate that 633 mg of soot was produced. Id. If one assumes 10% yield, then approximately about 66 mg of C₆₀ and about 53 mg of C₇₀ would be produced, which amounts are well above the amount that could be seen with the naked eye. Further, if a longer graphite rod were used, the amount of C₆₀ and C₇₀ produced would be even greater. Again, this provides ample evidence that the C₆₀ and C₇₀ produced in accordance with the present process is in macroscopic amounts.

Attention is further directed to U.S. Patent No. 6,077,401, attached to the Loutfy I Declaration which indicates in Column 2, lines 11-38 thereof that rods with ¼ inch diameter are capable of producing yields of around 15%. Consequently, since the amounts testified by Dr. Loutfy in the Loutfy I Declaration assumed yields of 8-10%, this means that the amount of C₆₀ and C₇₀ produced in the experiment conducted by Dr. Loutfy can be even higher, further supporting applicants' position that the underlying application provides a process for producing C₆₀ and C₇₀ in macroscopic amounts.

Thus, there is no question that the process described in the underlying application produces C₆₀ and C₇₀ in macroscopic amounts. The process described in the underlying application produces C₆₀ and C₇₀ in amounts that could be seen with the naked eye, which is the

definition of macroscopic amounts used in the industry. See Paragraph 19 of Loutfy I Declaration. This usage is consistent with the way that Board of Patent Appeals and Interferences interpreted the term macroscopic as used in the instant specification. See Decision of the Board of Patent Appeals and Interferences dated September 23, 1999, Pages 30-37 (hereinafter, "Decision").

The Office Action dismisses the Loutfy Declaration alleging that it is speculative. Further, the Office Action further alleges that statements made on Page 16 of the previous Response relating to statements made by Loutfy in the Loutfy Declaration are conclusionary, stating that "it presupposes that macroscopic amounts of solid were deemed to have been prepared previously with different sizes of graphite."

Applicants strongly disagree. The statements on Page 16 of the previous Response were based on the testimony of Dr. Loutfy in his Declaration. These statements are not speculative, but are based on his experimental findings. Attention is directed to Paragraphs 17, et seq., of Loutfy I Declaration which described the experiments performed by Dr. Loutfy upon which he bases his conclusions. As Dr. Loutfy testified, he repeated the process described in the above-identified application, and from his results, he calculated the amount of, inter alia, C₆₀ and C₇₀ produced by the process. From his data, Dr. Loutfy concludes that the C₆₀ and C₇₀ prepared by the process described in the instant application are each produced in amounts that are visible to the naked eye, that is, in macroscopic amounts. The point regarding changing the length of the rod was to emphasize the accuracy of the calculations made. Thus, the data provided in Dr. Loutfy's Declaration further supports that the inventors at the time of the filing of the instant application, were in possession of macroscopic amounts of C₆₀ and C₇₀.

Further, contrary to the allegations in the Office Action, color, in this instance, can be equated to macroscopic amounts. Attention is directed to the article by Curl and Smalley in Scientific American, 1991, referred to in the Office Action.

The author themselves equated color with macroscopic amounts. Attention is directed to Page 54, wherein the authors stated:

"Thus for five years, we had been searching for a method of producing visible amounts of the stuff. We called our efforts "the search for the yellow vial" because quantum calculations for such a soccerball-shaped carbon molecule suggested it would absorb light strongly only in the far violet of the spectrum...

In our laboratory we collected the sooty carbon produced by the vaporization base while using various chemical techniques to detect the presence of C_{60} . We slurried the soot in benzene, for example, and looked for a yellow color. But, the solution in our test tubes stayed clear, with boring black soot sitting on the bottom...

When the Kratschmer-Huffman group finally added benzene to their camel sample and saw the color red develop, they realized they were looking at the first concentrated solution of fullerenes ever seen. They evaporated the solvent and found that tiny crystals remained, which readily redissolved. These crystals could be sublimed under a vacuum near 400 degrees and condense on a cold microscope slide to form smooth films of solid materials...

In thin layers, these films were yellow (a fact that those of us at Rice University who searched for a "yellow vial" find highly gratifying.)

Id. Pages 54-57.

As shown by the description in the article by the Nobel laureates, Smalley and Curl, color, i.e., "the yellow vial" was equated with "visible amounts" of product.

As one reads the article, it is quite apparent that the whole thrust of the article was to describe the procurement of visible amounts, i.e., macroscopic amounts, of C_{60} and C_{70} . They

acknowledged that Huffman and Kratschmer were the first to achieve this feat by repeating the process which is exemplified in the Nature article published in 1990 by Huffman and Kratschmer and which details are also described in the present application. Thus, they admit that Huffman and Kratschmer were the first to isolate macroscopic amounts of same. They state, for example, that Huffman and Kratschmer

“... were the first to observe the roundest of all round molecules...”

Id. Page 54-57.

They “were looking at the first concentrated bottom of fullerenes ever seen.”

Thus, they admit that the Huffman-Kratschmer process produced macroscopic amounts of C_{60} and C_{70} by their process.

In fact the scientific community has recognized that the process of Huffman and Kratschmer, et al. which is exemplified in the article by Kratschmer, et al., Nature, 1990, 354, produces fullerenes, e.g., C_{60} or C_{70} in macroscopic amounts. Attention is directed to Column 1, lines 58-61 of U.S. Patent No. 6,077, 401, which is attached as Exhibit 2 to the Loutfy I Declaration. The ‘401 patent indicates that Huffman and Kratschmer were the first to isolate macroscopic amounts of C_{60} . In addition, attention is directed to the article by Curl and Smalley in which they admit that Huffman and Kratschmer were the first to isolate fullerenes, e.g., C_{60} and C_{70} , in macroscopic amounts.

It is to be noted that Huffman and Kratschmer, along with Smalley and Kroto, were given the 1994 Hewlett Packard Europhysics Prize by the European Physical Society for their discovery of fullerenes. In addition, only Huffman and Kratschmer and not Smalley, et al. were awarded the 1993 Materials Research Society Award for Synthesis and Pioneering Study of

Fullerenes. These awards and the accompanying information show that Huffman and Kratschmer discovered fullerenes. Furthermore, the Swedish Academy in their press release awarding the Nobel Prize to Kroto, and Smalley, et al., acknowledged the contributions of Huffman and Kratschmer for being the first to make macroscopic amounts of fullerenes. The process which they used to isolate the C₆₀, C₇₀ and other fullerenes in macroscopic amounts is the process which is described in the underlying application and exemplified in the Nature article.

Accordingly, one can reach only one conclusion with respect to the issue of the written description for the term "macroscopic amounts of C₆₀"; that is, there is adequate support, in compliance with the description requirement of 35 U.S.C. §112, first paragraph for the term "macroscopic" amounts of C₆₀ and C₇₀.

Thus, contrary to the allegations in the Rejection, there is adequate support in the application for the term "macroscopic" amounts of C₆₀ and C₇₀. Thus, for the reasons provided herein, the rejection of Claims 53-72, 86, 107, 111-152 and 154-180 under 35 U.S.C. §112, first paragraph is obviated; withdrawal thereof is respectfully requested.

Pursuant to the rejection of Claims 97-101, 109-110, 115-118, 120-121, 133-140, 158-161 and 171-180, under 35 U.S.C. §112, first paragraph, the Office Action alleges that the recitation of "amounts capable of" therein is indefinite, stating that the detection limits of the instruments are subject to change and may vary from instrument to instrument. The Office Action alleges that the lower limits are unclear. Applicants disagree that the language is indefinite for the reasons presented in the previous Response. However, inasmuch as applicants have cancelled without prejudice, Claims 97-101, 109-110, 115-118, 120-121, 133-140, 158-161 and 171-180, this rejection is rendered moot. Withdrawal thereof is respectfully requested.

Pursuant to the rejection of Claims 133-134, 138 and 161 under 35 U.S.C. §112, fourth paragraph, the Office Action alleges that these claims do not further limit the scope of the previous claim. Applicants again reiterate the arguments in the previous Response on this issue. However, inasmuch as applicants have canceled, without prejudice, Claims 133, 134, 138 and 141, the rejection of these claims is rendered moot. Withdrawal thereof is respectfully requested.

Pursuant to the rejection of Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 93, 96-107, and 109-180 under 35 U.S.C. §101, the Office Action alleges that these claims, absent the recitation of the term "macroscopic" or equivalent language thereto which the Office Action alleges is new matter - - a position with which applicants disagree - - embrace products found in nature. Applicants strongly disagree.

Before addressing the merits of the rejection, it is to be noted, as indicated hereinabove, that applicants have cancelled, without prejudice, Claims 45-51, 74, 77, 83, 88, 97-101, 109, 110, 115-118, 120, 121, 133-140, 158-161, 163-164 and 171-180. Thus, the rejection of these claims under 35 U.S.C. §101 is moot; withdrawal thereof is respectfully requested.

Each of the claims pending recite the limitation of "macroscopic amounts of quantities" and/or equivalent language thereto. This language must be read into the claims and cannot be ignored. Moreover, as indicated by the Board of Patent Appeals and Interferences in its Decision wherever C₆₀ and/or C₇₀ are found, they have not been found in macroscopic amounts. Attention is directed to the fact that the Board of Appeals and Interferences ruled in its Decision dated September 25, 1999 that the scope of Claims 45-81, 83-86 and 88-180 are not unpatentable under 35 U.S.C. §101. See Page 49 of the Decision. The Office Action alleges, by referring to the earlier Action that this rejection only applies if applicants delete the term "in macroscopic amounts" in the claims. Inasmuch as this term or equivalent language thereto is

recited in the pending claims, this rejection is not applicable. See, for example, Claims 53-72, 86, 96, 102, 103, 106, 107, 111-114, 119, 122-132, 141-157, and 162-170. Independent claims in which the term "macroscopic amounts" does not appear include Claim 73, which recites, "a formed or molded product comprising crystalline C₆₀"; Claim 75, which recites "a free flowing particulate comprised of crystalline C₆₀"; Claim 80, which recites "a formed or molded product comprising solid C₇₀"; and Claim 81, which recites "a free flowing particulate comprising solid C₇₀". But, no evidence has been presented that the products found in nature alleging to contain C₆₀ or C₇₀ is a formed or molded product, as recited in the claims. Thus, Claims 73, 75, 80, 81, and claims dependent thereon do not read on a natural product for still another reason.

The same rationale also applies to Claims 104-107. Although they recite that the C₆₀ or C₇₀, is present in macroscopic amounts, they also recite, in addition, similar language. More specifically, Claims 104-107 are reproduced hereinbelow:

104. A formed or molded product comprising C₇₀, said C₇₀ being present in a macroscopic amount.

105. A free flowing particulate comprising C₇₀, said C₇₀ being present in a macroscopic amount.

106. A formed or molded product comprising C₆₀, said C₆₀ being present in a macroscopic amount.

107. A free flowing particulate comprising C₆₀, said C₆₀ being present in a macroscopic amount.

Again, since there is no evidence that in nature, wherever they are found, that C₆₀ or C₇₀ is present in a formed or molded product or a free flowing particulate. Thus, Claims 104-107 do not recite products of nature for a second reason.

Claims 92 and 93 are directed to crystalline C₆₀ and C₇₀, respectively. However, no evidence has been presented that C₆₀ or C₇₀ when naturally found is crystalline. Thus, for still another reason, Claims 92 and 93 do not read on a natural product.

These are the only claims that are pending and are rejection which do not recite the term "macroscopic amounts therein". Thus, none of the rejected claims read on product of nature.

Moreover, Claims 113, 114, 119 and 123-32 do not read on products of nature for still another reason. None of the evidence provided by the United States Patent and Trademark Office refer to any sort of soot containing C₆₀ or C₇₀, which is capable of deriving therefrom C₆₀ or C₇₀ macroscopic amounts. This is quite apparent, especially since none of the articles found any soot containing any fullerenes - - let alone C₆₀ or C₇₀. Furthermore, even assuming pro arguendo, that there was soot containing C₆₀ or C₇₀, since C₆₀ or C₇₀ have not been found in macroscopic amounts in nature, any soot containing C₆₀ and C₇₀ would not be capable of producing C₆₀ or C₇₀ in macroscopic amount s. Thus, for the second reason, Claims 113, 114, 119 and 122-132 do not read on products of nature.

Thus, for the reasons presented herein, the rejection of Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 93, 96-107, and 109-180 under 35 U.S.C. §101 is obviated; withdrawal thereof is respectfully requested.

Pursuant to the rejection of Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 93, 96-107, and 109-180, the Office Action alleges that the subject matter therein is anticipated by the teachings in Kroto, et al. with the Curl, et al. article cited to show an inherent state of fact. Inasmuch as applicants have cancelled without prejudice Claims 45-51, 77, 83, 97-101, 109, 110,

115-118, 120, 121, 133-140, 158-161, 163, 164 and 177-180, this rejection with respect to those claims is rendered moot. Withdrawal thereof is respectfully requested.

The Office Action also further incorporates this rejection from the Office Action of November 30, 1992 by reference. According to the incorporated Office Action, this rejection would apply to Claims 86, 96, 102-108, 111-114, 119, 141, 162 and 165-168 if applicants delete the term "macroscopic amount" therefrom. However, applicants have not deleted the terms "macroscopic" therefrom and thus the rejection of these claims on this ground is obviated; withdrawal thereof is respectfully requested.

In addition, Claims 53, 86, 102, 103, 104, 105, 106, 107, 111, 112, 113, 119, 141, 165, 166, 167, 168, 169, 170 and claims dependent thereon all recite the term "macroscopic amounts". Thus, inasmuch as the limitation of the term "macroscopic amount" is recited in these claims, based on the statements in the Office Action. The rejection of these latter claims under 35 U.S.C. §102(b) is obviated; withdrawal thereof is respectfully requested.

The remaining rejected claims recite crystalline C₆₀ or C₇₀ or solid C₆₀ or C₇₀. (See, e.g., Claims 73, 75, 80, 81, 92, 93) or substantially pure C₆₀ or C₇₀ (See, e.g., Claims 84 and 89).

But, Kroto, et al. never isolated any solid or comprising crystalline C₆₀ or C₇₀, in fact, they never isolated any product in the solid form at all.

Kroto, et al. report on the detection of C₆₀ and C₇₀ using time of flight mass spectrometry in the vapor phase. However, they never isolated or recovered visible particles of C₆₀ and C₇₀. They never produced C₆₀ or C₇₀ as a solid or in solid form, let alone crystalline C₆₀ or C₇₀. See, Curl, et al. See, also Loutfy I Declaration Paragraph 12. In addition, they did not disclose a process that would teach or lead others to do so. See, Curl, et al. and Loutfy I

Declaration, Paragraph 2. They admit that they only made small amounts. As described in Curl, et al., on page 54,

they could "not collect more than a few tens of thousands of the special new molecules [fullerene]. This amount was plenty to detect and probe with the sophisticated techniques available in our laboratory, but there was not enough to see, touch or smell. Our evidence was indirect... For now, the fullerenes existed only as fleeting signals."

No matter how much they tried they were always unsuccessful in making amounts sufficient to see, i.e., macroscopic amounts.

Thus, Curl, et al., on commenting about the experiments described in Kroto, et al. admit that they could not make enough to collect the fullerenes as a solid or in solid form or in macroscopic amounts or equivalent language thereto. Thus, contrary to the allegation in the Office Action, Kroto, et al. never made a solid comprising solid or crystalline C_{60} or C_{70} , since Kroto, et al. never made enough to collect a crystalline or solid C_{60} or C_{70} . Thus, the process of Kroto, et al. was not capable of making sufficient amounts of C_{60} or C_{70} to make crystalline C_{60} or C_{70} . The process of Kroto, et al. never formed C_{60} or C_{70} or other fullerenes in any amounts that could be seen with the naked eye or isolated as a solid whether it be in the soot or not. They never prepared solid C_{60} or solid C_{70} . Kroto never made C_{60} or C_{70} in amounts that could be seen, touched or felt. They never made C_{60} or C_{70} in macroscopic amounts. Since they made only a few molecules of fullerenes, they could never isolate C_{60} or C_{70} in solid form, as claimed. Moreover, as a consequence thereof the soot formed in the Kroto, et al. process is not comprised of solid particles consisting essentially of C_{60} or C_{70} or soot capable of producing C_{60} or C_{70} in macroscopic amounts, as claimed.

Thus, the claimed subject matter differs from the subject matter described in Kroto in at least one aspect. The claims, as defined, recite greater amounts than that described in Kroto, et al. Since anticipation under 35 U.S.C. §102 requires that the prior art reference discloses each and every element of the claims, and since the absence of an element in the claim relative to the prior art negates anticipation, inasmuch as Kroto, et al. do not disclose the C₆₀ and C₇₀ being present in the amounts claimed - - an important element of the claims- - the claimed subject matter in the rejected claims does not anticipate the present invention.

Moreover, applicants respectfully submit that the Kroto, et al. article is non-enabling to make fullerenes, e.g., C₆₀ or C₇₀ in macroscopic amounts or language equivalent thereto, e.g., solid form, as a solid, in macroscopic amounts or in equivalent language.

They never prepared solid or crystalline C₆₀ or C₇₀, as presently claimed. It was not possible to prepare C₆₀ or C₇₀ solid or, for that matter, C₆₀ or C₇₀, in any appreciable amounts, without undue experimentation. As stated in Curl, et al., despite extensive efforts by the scientific community, no one prior to Kratschmer and Huffman was successful in preparing C₆₀ or C₇₀ in any appreciable amounts. Consequently, Kroto, et al. do not teach, disclose, or even suggest solid C₆₀, or solid C₇₀, crystalline C₆₀, crystalline C₇₀, solids consisting essentially of C₆₀ or C₇₀, etc., or any matter comprised of solid C₆₀ or C₇₀ as presently claimed.

To be enabling, a reference must describe an invention sufficiently to have placed the public in possession of it. In re Donahue, 766 F.2d 531, 226, USPQ 619 (Fed. Cir. 1985). The printed publication must be enabling. Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 7 USPQ 21 1057 (Fed. Cir. 1988). The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosure in the reference coupled with the information known to one skilled in the art without undue experimentation. United

States v. Teletronics, Inc., 857 F.2d 778, 775 8 USPQ 21 1217 (Fed. Cir. 1988), cert. denied 109 S.Ct. 1954 (1989).

But, the public was not possessed of a method of preparing, isolating, and C₆₀ and C₇₀, in the amounts claimed in the present application, including a C₆₀ or C₇₀ in the solid state. Based on the teachings by Kroto, et al., people skilled in the art were unsuccessful in preparing macroscopic quantities of C₆₀ or C₇₀. Despite extensive efforts, no solid of C₆₀ or C₇₀ could be made or isolated until these were prepared and isolated by the present inventors. Furthermore, despite extensive efforts, no crystalline C₆₀ or C₇₀ was ever prepared and isolated by others prior to the filing date of the instant application. Further, no material containing solids comprising solid C₆₀ and/or solid C₇₀ were made until the present inventors developed the methodology. Thus, Kroto, et al. did not place the public in possession of the applicants' invention.

It is well settled that prior art under 35 U.S.C. §102(b) must sufficiently describe the claimed invention to have placed the public in possession of it Such possession is effected if one of ordinary skill in the art could have combined the publication's description of the invention with his own knowledge to make the claimed invention. Accordingly, even if the claimed invention is disclosed in a printed publication, the disclosure will not suffice as prior art if it was not enabling... In re Donahue, 766 F.2d 531, 533, 226 USPQ 619, 621 (Fed. Cir. 1985).

Moreover, the Court continues that if the reference teaches that attempts to make the invention failed, as in the present case, the reference is non-enabling:

...In those cases, the references were deemed insufficient because they stated that attempts to prepare the claimed compounds were unsuccessful. Such failures by those skilled in the art (having possession of the information disclosed by the publication) are strong evidence that the disclosure of the publication was non-enabling. Id.

Furthermore, Kroto, et al. were completely unsuccessful in making, isolating and collecting C_{60} and C_{70} in any appreciable amounts. They only had indirect evidence of what it is that they made. They never made solid C_{60} and C_{70} . They never made or isolated a crystalline form of C_{60} and C_{70} . Whatever they made, they only made it in non-measurable amounts. At best, they could only make molecules of something, only tens of thousands of molecules, which they could not touch, see or smell. No matter how much they tried, they were always unsuccessful in making more. They could never make enough material to put it in the possession of the public:

Thus, for five years, we had been searching for a method of producing visible amounts of the stuff. We called our efforts "the search for the vial" because quantum calculations for such a soccer ball shaped carbon molecule suggested it would absorb light strongly only in the far violet of the spectrum....

Curl, et al. at 55.

Contrary to the allegations the Office Action, Kroto, et al. did not make the amounts of fullerenes, e.g., C_{60} or C_{70} in the amounts recited in the rejected claims or place the public in possession thereof. Thus, Kroto, et al. is non-enabling for making the amounts claimed in the present process and cannot be used for that purpose.

Moreover, the Kroto, et al. process was different from the process of the present invention for still another reason. Attention is directed to Loutfy I Declaration in which Dr. Loutfy distinguishes the process of the present invention from that of the prior art. See paragraph 15 of the Loutfy I Declaration. More specifically, unlike the prior art, including the process of Kroto, et al., the present process produces a high density of the vapor of carbon, as described on Page 4 of the subject application resulting in the formation of macroscopic amounts

of fullerenes by the present method. Id. The Kroto, et al. process could not produce a high density of vapor of carbon by their process. Since Kroto, et al. could not produce a high density of vapor of carbon by their process, they could not provide C₆₀ or C₇₀ in macroscopic amounts or as a solid or crystalline solid.


Further, since Kroto, et al. never isolated any fullerenes, including C₆₀ and C₇₀ in any appreciable amounts, the soot containing same never was capable of producing C₆₀ or C₇₀ in macroscopic amounts, as recited in Claims 113, 114 and 119-132.

Moreover, there is no evidence that Kroto, et al. produced substantially pure C₆₀ or substantially pure C₇₀, as recited in Claims 84 and 89. Kroto, et al. never isolated substantially pure C₆₀ or C₇₀ per se. In the experiments, described in Kroto, et al. Kroto, et al. vaporized graphite using laser in a helium atmosphere. The species found may have been ionized at this present. But, even if not ionized, any C₆₀ or C₇₀ species formed was part of a gaseous mixture, in which the majority of the material was soot (amorphous carbon). As part of a mixture, any neutral C₆₀ or C₇₀ formed was not substantially pure. The mixture was then (further) ionized and separated in a time-of-flight mass spectrometry. In the mass spectrometer, positively charged fragments were formed. The mass spectrometer then separated the positively charged species. Thus, Kroto, et al. never formed substantially pure C₆₀ or C₇₀, since any C₆₀ or C₇₀ initially formed was a small percentage of a gaseous mixture; and when separated, each was positively charged. Thus, the subject matter in Claims 84 and 89 is not anticipated by Kroto, et al.

Thus, for the reasons given herein, the rejection of the aforementioned claims under 35 U.S.C. §102(b) is overcome; withdrawal thereof is respectfully requested.

Thus, in view of the Amendment to the claims, and the remarks herein, it is respectfully submitted that the present case is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,



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